

VITAL STATUS IN THE NATIONAL PANEL SURVEY OF BLACK AMERICANS: A TEST OF THE NATIONAL DEATH INDEX AMONG AFRICAN AMERICANS

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To test the specificity of the National Death Index (NDI), information was submitted on 157 randomly selected respondents from the National Panel Survey of Black Americans (NPSBA) who were known to be living as of 1992. Information also was submitted for 153 known deceased respondents from the panel survey to test the sensitivity of the NDI. The NDI was very sensitive; however, specificity was somewhat less impressive. Although we found the NDI/NPSBA match to be highly accurate, there was a nontrivial number of false positives. (*J Natl Med Assoc.* 1996;88:501-505.)

Key words • blacks • national death index • mortality

The National Death Index (NDI) is an automated database containing death records from each of the 50 states, Puerto Rico, and the Virgin Islands. Since its initiation in 1979, the NDI has become a valuable tool for researchers interested in determining the vital status of

study participants.¹⁻⁴ Published examinations of the accuracy of the NDI have tested it under various conditions including with and without social security number,⁵⁻⁸ on sex specific samples with and without maiden name,^{5,7} and on national and local samples.⁹⁻¹³

Each of the published examinations of the NDI have reported a high accuracy rate. Table 1 shows published accuracy rates ranging from 83% to better than 98%. However, several articles have speculated that the NDI might be less accurate for determining vital status for members of ethnic and racial minority groups than for whites.^{6,11} This hypothesis has never been directly tested. The following study was undertaken to test this hypothesis on a national survey of African Americans.

METHODS

The National Survey of Black Americans is a national multistage probability sample of 2107 African Americans conducted by the Program for Research on Black Americans of the University of Michigan in 1979.¹⁴ This survey forms the baseline for the four-wave National Panel Study of Black Americans (NPSBA), with data collections in 1987, 1988, and 1992.

The NDI matching procedure uses 12 algorithms or matching criteria to identify potential matches between persons submitted by the investigator and persons in the NDI database. These NDI algorithms are based on various combinations of social security number and names or date of birth and names. These algorithms will generate "possible NDI record matches" based on agreements on the following nine identifying characteristics: first name, last name, middle initial, father's surname,

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TABLE 1. PUBLISHED EVALUATIONS OF THE NATIONAL DEATH INDEX

Author	Year	Matching Variables	Sample Description	Accuracy Rate
Wentworth et al ⁹	1983	SSN, name, date of birth, marital status, sex, race, state of last known residence	191 subset of known decedents among a study of 12,866 respondents, the Multiple Risk Factor Intervention Trial	98.4%*
Stampfer et al ⁷	1984	Name, month & year of birth, age at death, sex, race, marital status, state of residence, state of birth	570 subset of the 121,964 married, female nurses from 11 states, Nurses' Health Study	96.5%*
Davis et al ¹⁰	1985	Name, date of birth, SSN, race, sex	370 known decedents & 810 living persons from the 24,959 patients enrolled in the Coronary Artery Surgery Study (CASS)	93.0%*
Curb et al ⁶	1985	Name, date of birth, SSN (SSN data not complete), race, sex, marital status, state of residence, father's surname	1322 known decedents (1154 with SSN & 168 without SSN) from the Hypertension Detection & Follow-up Program	45.2% ^{2†} 91.2%* 87.0%‡
Acquavella et al ¹¹	1986	Name, SSN, date of birth, race, marital status, sex	1449 known decedents from a cohort of 23,451 petrochemical & refinery workers	97.1%* 97.2%§ 92.0% 97.6%¶ 92.0%**
Boyle & Decoufle ⁵	1990	Name, SSN, month & year of birth	407 known decedents from the Vietnam Experience Study	97.0%*
Williams et al ⁸	1992	Name, day, month, & year of birth, SSN	Residents of Department of Veterans Affairs nursing homes, 500 known dead & 3487 known living respondents	83.0%†† 92.0%‡‡
Calle & Terrell ¹²	1993	Name, date of birth, SSN, sex, race, marital status, state of residence, state of birth	5406 known decedents & 10,052 living persons from the Cancer Prevention Study II	93.0%‡ 97.0%§§ 87.0%*
Rich-Edwards et al ¹³	1994	Name, SSN, date of birth, state of residence, & sex	1997 nursing for whom SSN was available, who were known alive in 1992, & 197 nurses who were known dead in 1989 or 1990, Nurses' Health Study	98.0%†

Abbreviations: SSN=Social Security number.

*Social Security number not available.

†Social security number was available.

‡Both with and without Social Security number combined.

§Males.

||Females.

¶Whites.

**Nonwhites.

††First initial, last name, month and year of birth.

social security number, month, day, and year of birth, and sex. National Death Index users also are encouraged to collect and submit four additional identifying characteristics (race, marital status, state of residence, and state of birth) to assist the investigator in further assessing the accuracy of the possible NDI matches that are generated. The NPSBA does not have data on social security number or father's surname; however, data on the remaining identifying characteristics are available.

We conducted two tests of the NDI. The first test examined the sensitivity of the NDI, and the second test examined specificity. Sensitivity refers to the ability of a test to correctly identify true positives (ie, NPSBA respondents known to be deceased who are correctly identified by the NDI as deceased). Specificity refers to the ability of a test to correctly identify true negatives (ie, NPSBA respondents known to be alive who are not listed as deceased by the NDI).

For the sensitivity analysis, we submitted to the NDI the names of 153 (77 male and 76 female) respondents from the NPSBA baseline survey who were known to have died before the fourth wave of the panel in 1992. For the specificity analysis, a random sample of 157 (109 female and 48 male) of the 744 NPSBA respondents who were known to be living as of 1992 was submitted.

RESULTS

Table 2 displays the results of the sensitivity analysis. The Table shows that the NDI returned 143 true positive matches (NDI correctly indicated that a decedent had died) of 153 decedents. This is an overall sensitivity of 93.4%. The 10 false negatives were NPSBA decedents who may have been in the NDI database but who were not identified based on any of the 12 matching criteria. The analysis also indicates no sex difference in the sensitivity of the NDI (93.5% for males and 93.4% for females).

For the specificity test, the NDI reported no potential matches for 67 (42.7%) persons, thus correctly indicating that they were alive as of 1992. Forty-one percent of the females and 46% of the males did not have any NDI listings. The remaining 90 NPSBA respondents had at least one potential match in the NDI database.

To more fully examine these potential matches, a set of evaluation criteria was established to identify potential matches that would require further examination (ie, securing death certificates) as opposed to potential matches that were clearly not the person from the NPSBA. Each potential match was evaluated on five variables (state of birth, race, sex, last name and first initial, and either year of birth correct or month of birth

TABLE 2. RESULTS OF THE NATIONAL DEATH INDEX (NDI) SEARCH OF THE NATIONAL PANEL STUDY OF BLACK AMERICANS AMONG KNOWN DECEASED RESPONDENTS

Known Dead as of 1992	Records Submitted by Investigator	Total NDI Matches	Sensitivity (%)
Male	77	72	93.50
Female	76	71	93.42
Total	153	143	93.46

correct and year of birth within 10 years). If the NDI generated a potential match that did not match the NPSBA respondent on at least four of these five criteria, the NDI-generated potential match was eliminated. If the potential match coincided with the NPSBA respondent on at least four of the five variables, the potential match was considered to be a false negative (NDI indicating a survivor was dead).

The results of this analysis are displayed in Table 3. The Table indicates that of the 90 NPSBA respondents who had at least one potential match, 54 (34.4% of the 157 living NPSBA respondents) did not meet the evaluation criterion. The remaining 36 (22.9%) of the 157 known living respondents had at least one potential match that was close enough to require further examination.

We can calculate the specificity of the NDI for the NPSBA by adding the number of respondents who had no NDI-generated potential matches (67) to the number that did not meet the evaluation criterion (54) and dividing that result by the total number of NPSBA respondents (157). This results in an overall specificity of 77.1%.

The specificity of the NDI was somewhat better for females. Of the 64 female respondents that had at least one potential match, 43 did not meet the evaluation criterion. The remaining 21 females did meet the criteria. This results in a female specificity of 80.7%. For the NPSBA males, 26 of the 48 had at least one NDI potential match. Of these, 11 did not meet the criteria. The remaining 15 males did meet the criteria. Thus, the male specificity is 68.8%.

DISCUSSION

The NDI accurately identified 93.46% of the deaths in the NPSBA, which is consistent with other examinations of the NDI that did not include social security number. For example, Stampfer et al⁷ found a sensitivity of 96.5%. Calle and Terrell¹² found a sensitivity of 87%. Moreover, we did not find a sex difference in the sensitivity of the NDI. The sensitivity of 93.5% for males was essentially equal to the 93.4% sensitivity for

TABLE 3. RESULTS OF THE NATIONAL DEATH INDEX SEARCH OF THE NATIONAL PANEL STUDY OF BLACK AMERICANS AMONG KNOWN LIVING RESPONDENTS

Known Survivors as of 1992	No. Records Submitted by Investigator	No. Without Potential Matches	No. Potential Matches Ruled Out	Specificity (%)
Male	48	22	11	68.8
Female	109	45	43	80.7
Total	157	67	54	77.1

female respondents. However, there was a substantial sex difference in specificity. The overall specificity was 77.1% (80.7% for females and 68.8% for males). This is substantially below the specificity found by Stampfer et al.⁷ However, the evaluation criteria used in that study to eliminate the 12 potential matches of 9 of their 224 respondents who were known to be living was more restrictive than our criteria. For example, they rejected the majority of their NDI matches because birth dates failed to match exactly. By contrast, we accepted a potential NDI match as a false positive if the year of birth was off by as much as 10 years, and we did not consider the day of birth at all (only month of birth and year of birth within 10 years).

These liberal evaluation criteria were established because we were concerned that minor errors, such as an inverted date of birth (eg, 21 verses 12) or recording a name as "Will" while the NDI recorded the name as "Wilbert" would cause us to reject a true match. While our liberal evaluation criteria would likely improve accuracy, it results in increased costs since we would need to purchase more death certificates to verify matches. The NDI printout does not include the full first name for potential matches. Thus, if the investigator's data recorded a name as "Will Jones" and the NDI records list the individual as "Wilbert Jones," the NDI printout would indicate an exact match on last name with only the initial of the first name matching. The only way to obtain the first name of the potential match would be to obtain the death certificate from the state of death.

In the present study, if we had not already known that all 157 respondents in our specificity analysis were alive, we would have had to secure death certificates for 36 NPSBA respondents who were alive (22.9% of 157). At an average of 1.8 death certificates per person (since in many cases respondents have multiple potential matches) and an average cost of \$5 per death certificate, the total cost would be \$324.00. This is not a trivial cost to detect only 36 false positives (\$9 per person).

The degree to which the NDI can accurately detect deaths in follow-up studies, such as the NPSBA, depends on the accuracy of the investigator's data as well as the accuracy of the data reported to the NDI. As

the number of records in a database increases, the number of potential errors also increases. However, despite the myriad sources of potential error, we found the NDI to be highly sensitive, even without social security number. Specificity, however, was somewhat less impressive. Thus, although we found the NDI/NPSBA match to be highly accurate, there was a nontrivial financial cost for the detection of false positives.

Previous examinations of the NDI found that the addition of social security number provided a substantial benefit in detecting vital status.^{6,12} If social security number was available for the NPSBA, the specificity would no doubt have been markedly better. This would have the effect of reducing research costs by reducing the number of death certificate searches. In future studies, researchers would be well served to obtain social security numbers when possible.

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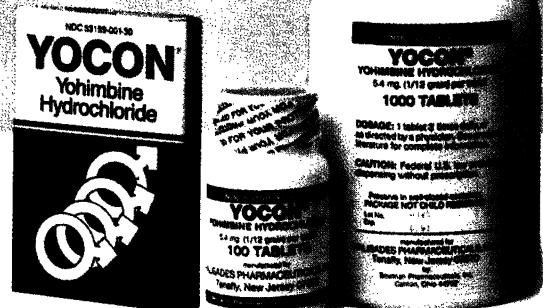
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